THURSDAY, FEBRUARY 10, 1887

THE HISTORY OF HOWIETOUN

The History of Howietoun. Part I. By Sir J. Ramsay Gibson Maitland, Bart. (Stirling, N.B.: J. R. Guy, Secretary Howietoun Fishery, 1887.)

PROBABLY every one at all interested in fish-breeding has heard the name of Howietoun, and a great many people, especially in Scotland, have some knowledge of the character of the establishment and the operations there carried on. Occasional paragraphs in scientific periodicals, as well as in daily papers, announce some experiment in the artificial stocking of home waters with some kinds of trout or with salmon fry, or some successful exportation of salmonoid ova to America or to the colonies at the Antipodes. The name of Sir James Maitland or of Howietoun very often occurs in such announcements. Those who have given attention to the subject will find much to interest them in the account of the development of his fish-farm, and in the description of its present condition, which Sir James Maitland is now placing before the public. At present we have only the first part of the work, in which the history is brought down to the spring of 1879. A note on the fly-leaf informs us that the remaining part will be issued shortly. The present volume is of large quarto size, printed in large type, and liberally illustrated with excellent woodcuts.

The author states in the preface that the culture of Salmonidæ is now an achieved success, and he describes the gradual progress of the efforts which have culminated in this result at Howietoun, with the hope that his experience may prove of use to those who are working on the still larger question of our sea-fisheries. The first seven chapters contain a general description of the regular operations which are now carried on after thirteen years of practice and experimental ingenuity at the Howietoun farm. Sir James Maitland asserts emphatically that Great Britain is pre-eminent among all nations in matters pertaining to fisheries. He does not argue at any length in support of this patriotic claim, which he seems to found chiefly on the perfection of the Howietoun establishment, and the success of the system of Government supervision under which the Scottish herring trade is carried on. His eulogy of these two institutions is quite justified by facts, and there can be little doubt that the value of the fisheries of Great Britain, in proportion to the total population and total wealth, is greater than in many other countries. But there are other matters pertaining to fisheries in which the pre-eminence of Great Britain may well be disputed, and has been disputed very frequently of late years. The scientific study of the sea-fisheries, and the application of the results of such study, have undoubtedly been carried out to an enormously greater extent in other countries than with us. The reproduction of the cod was first investigated in Norway; oyster-culture as understood in Holland and in France is still unknown in Britain; and the organised scientific investigation of fishery matters, which has been commenced by the Scottish Fishery Board and is about to be instituted by the Marine Biological Association in England, has been, as it were, forced upon us by the example of the United States. Perhaps no American salmon-hatchery is quite as efficient as the Howietoun farm, but the extent of piscicultural operations applied to Salmonidæ in the United States is certainly greater on the whole than in Britain. This is not the occasion, however, for a complete comparison of Great Britain with other countries with regard to pisciculture. The history of Howietoun shows how greatly Sir James Maitland, by his individual energy and enterprise, has advanced the art of breeding Salmonidæ, and we have to notice shortly some of the most interesting parts of his book.

Before considering particular points, we may remark that the "History of Howietoun" is a book that can not only be referred to with profit, but read with pleasure. The author's genial individuality has an interest of its own, and his pages are full of suggestions of healthy, cheerful, energetic out-door life which make them picturesque and refreshing. The use of the plural "ova" as a singular seems to be common among pisciculturists, and it is a pity that this small blemish was not remedied in the proofs.

The greater number of the ova hatched at Howietoun are from Loch Leven trout kept in ponds at the farm. Ova are collected from wild *Salmo salar* taken from differen Scottish rivers, and small numbers of ova of *S. fario* and *S. fontinalis* are dealt with, but the greatest amount of space and attention seems to be devoted to *S. levenensis*. In the account of the "egg harvest" some interesting discoveries are mentioned which show a constant relation between feeding and breeding. If the fish are highly fed at an early date in the year, they begin to spawn earlier; the food used for this purpose is Pecten, and if this is given early in February, maturity is reached early in November. To obtain the eggs for the hatchery the females are stripped over large earthenware milk-plates, into which the ova fall. About 10,000 ova are stripped into one pan, and these can usually be impregnated by the milt of one male. After the milt has been added, only a tumblerful of water is poured into the pan; the eggs are then left to impregnate for 30 to 45 minutes. The ova, when first shed, are soft to the touch and inclined to adhere together; after impregnation they feel hard, and separate easily. The next process is to pour the ova into large pails full of water, which are held immersed in one of the inlets to the ponds, so that the milt is washed away; the ova are then carried in the pails to the hatching-house.

Collecting ova from fish in the wild state is a much more laborious process than from the fish in the ponds, and Sir James advocates strongly the advisability of Fishery Boards building proper ponds in which to retain the gravid fish until ripe. At Howietoun 20,000,000 trout (presumably *levenensis*) ova can be produced at a cost of little over 1000*l.* a year

The account of work in the hatching-house would naturally follow that of the egg-harvest, but the chapter on packing has been inserted between them. The work in the hatchery is described in detail. The eggs are poured with a glass measure over the centres of the glass tubes forming the *grilles*, and afterwards dressed into regular rows by "feathering," an operation performed by girls, as the eggs at this stage are easily killed by too much handling, and a trained girl can give the slight motion which is required to the eggs without actually touching them with the feather at all. Each box is entered by a number in a book, and a record of the number of dead eggs daily taken from it is kept on a printed form, and afterwards entered in the same book. Two girls only are employed in attending to all the hatcheries at Howietoun. The stage in the development of the ova between the formation of the blastoderm and the appearance of the eyes is called the "spectacle" stage, and the health of the embryo can be estimated by certain signs at this period; but the description given of these signs is not easy to follow. Up to the eye stage the ova are very delicate, but as soon as the eyes appear the eggs can be handled, and this is the best age for packing for the Antipodes. Eggs for America or Europe are packed at a later period, when red blood has appeared. When the eggs are ready to hatch, the *grilles* are taken out, the boxes cleaned, and the eggs are emptied off the *grilles* on to the bottom of the box. The depth of water in the boxes containing the alevins is only 3 inches. The alevins congregate in dense masses in the corners and against the sides of the hatching-box, and the motion of the pectoral fins causes a continuous current to descend downwards through the mass. When the yolk-sac is nearly absorbed, the fry are fed with food prepared from fillet of beef or of horse, and yolks of hard-boiled eggs. The food is made into paste in a mortar, and rubbed through "feeding-spoons" of perforated zinc into the hatching-box.

Next follows an account of the method of despatching living fry. These cannot travel for more than twenty-four hours, and they are sent in tanks quite full of water, as motion of the water exhausts the fish at this stage. The greater number of the fry, after a short time in the hatching-house, are placed in ponds constructed of wood, 100 feet in length, where they remain throughout the summer, and where they are fed daily by hand for the whole time. It is stated that 100,000 trout eleven months old would consume between two and three horses a week.

A considerable amount of stocking is effected with yearling trout, which are carried in conical tanks. The fish must be starved some days before being despatched, as, if placed in travelling-tanks when fully fed, they rapidly make the water foul. In the bottom of the lid of the tank is an inverted cone perforated with holes and filled with ice; this keeps a constant temperature, and promotes aëration of the water. Two-year-old, and even larger, trout are also sent out; these are placed in larger tanks, provided with small wheels, but constructed on the same principle.

In Chapter III. an elaborate account is given of the methods of packing ova. The first operation is to transfer the ova which are to be packed from the *grilles* to peach netting stretched on square wooden frames. This step is carried out in a specially constructed sink, through which water is kept running. The ova are emptied from the *grille* into a wooden box, from which they pass into a leaden basin with a narrow bottom. One of the frames is then floated in the sink, and a glass measure containing 1100 eggs is used to measure the eggs from the basin on to the frame. The frames are placed in the packing-room in piles, one pile for each box. Next morning the frames are examined, so that any egg with an ill-developed embryo may be picked out. Then, a square of swan's-down, contained in a special tray, is placed over the eggs on the frame, and, the two being suddenly reversed, the eggs rest on the swan's-down without altering their relative position; thus each egg lies separately on the swan's-down. The frame is removed, and the square of swan's-down with its burden placed in one of the travelling-trays. Above the eggs is next placed a square of felted moss (*Sphagnum*). Above the moss is placed another layer of swan's-down carrying a layer of eggs, and then another layer of moss, and so on, till the travelling-tray is filled. The bottom of the travelling-tray is made of perforated zinc, and before any eggs are placed in it, the bottom is covered with a thin layer of moss. The eggs thus rest on swan's-down, and are covered with felted moss, a layer of which also forms the lowest and uppermost layer of the tray when full. For journeys to the Continent or America, unbleached lino is substituted for the swan's-down, because swan's-down retains so much carbonic acid that advanced embryos are asphyxiated. For the Antipodes, an extra precaution has to be taken: a thin layer of moss is inserted between the layer of unbleached lino and the eggs, so that the latter are in contact with the moss above and below. The travelling-tray is 10 inches square and 2½ inches deep. The trays are packed in an inner box only ⅜ inch larger than themselves, and this is placed in an outer box 4 inches deeper and 3 inches wider than the inner. Between the two is a layer of sawdust. The outer box or case measures 1 foot 4 inches square, by 1 foot 10 inches deep. This is the method of packing for short journeys within the United Kingdom. The boxes for foreign consignments are larger, and oblong in shape; there is a sawdust space as in the boxes already described, but the trays are separated by means of charred fillets, so that an air-space surrounds each tray: above the pile of trays is a large ice-tray, which occupies the whole of the top of the box. Ova can be safely kept in one of these boxes during a period of sixty days.

In the chapter on "breeders" we have an account of the most unique feature of the Howietoun establishment,—the feature which entitles the place to be called a fish-*farm*, and not merely a hatchery. Salmon and trout eggs have been artificially fertilised and kept in hatching-houses by a great many pisciculturists, but never before the institution of the Howietoun system has a species of Salmo been treated after the same method which is applied by agriculturists to domestic cattle. Sir James Maitland may be said to have domesticated the Loch Leven trout. He keeps them in a system of ponds, where they are placed under more favourable conditions than they meet with in the wild state, where they are supplied with a constant abundance of food, and are protected from enemies. The Howietoun trout have been rescued from the battle of life and subjected to the influences of cultivation and artificial selection. A flow of 5,000,000 gallons of water per diem is made to support a stock which produces 20,000,000 ova annually. The original stock of breeding-fish was raised from eggs taken at Loch Leven in 1874. As the fish grew older the size of their eggs increased, the fry from these ova were bigger and stronger each season, and it became evident that the ova of old trout were much the most valuable.

Time has not yet shown whether the new generation of breeders raised from selected ova of the largest trout, in their turn produce still finer ova and fry, but there can be little doubt that this will be the case.

The history of the gradual improvement of the pisci-cultural apparatus given in Chapters VIII. to XVII. is extremely interesting. A detailed account is contained in these chapters of the increasing amount of stock, and of the hatching operations in succeeding seasons. But enough has been said to show the character and value of the first part of the work. The second part will contain descriptions of the experiments which have been made at Howietoun since the establishment reached its present complete and efficient condition. J. T. C.

HARMONY AND COUNTERPOINT

Elements of Harmony and Counterpoint. By F. Davenport, Professor of Harmony, &c., Royal Academy of Music. (London: Longmans, 1887.)

YEARS ago, when the laws of musical sounds, like the laws of Nature before Newton, lay hid in night, it was not unusual for clever and ingenious writers on music to invent what they called "systems of harmony." They found certain combinations and progressions in use by by the best composers, and they conceived it to be their duty to explain, or account for, or justify these by some kind of imaginary natural principles, more or less fanciful, which they conjured up out of their inner consciousness, to fit the case. But, unfortunately, these writers widely disagreed among themselves as to the principles on which their theories should be based, and the result was such a mass of contradiction and confusion that the very name of theoretical harmony became a by-word and a scandal, until the Newton of musical acoustics, Helmholtz, arose, and, by explaining the real nature of musical sensations, swept away these fanciful inventions into deserved oblivion.

Among these systems, however, was one, published in 1845, by a Dr. Alfred Day, which had the great good luck to be admired and patronised by no less a personage than Sir George Macfarren, the Principal of the Royal Academy of Music. So far as we know, this admiration has not been widely shared by musicians in general; but it would be idle to ignore the great weight that such an opinion must carry, and it is this, no doubt, that has preserved for Dr. Day's work an existence which might otherwise have terminated long ago.

It is natural that Prof. Macfarren should wish this system followed at the famed institution over which he presides, and the little book before us appears to be intended as a cheap manual for the purpose. No one need object to this, for, when it comes to the practical teaching of harmony, it matters little whose system is followed so that the orthodox forms of writing are taught and recommended. That system is the best which renders this knowledge easiest to acquire. It is a feature of Dr. Day's book, that he lays down strict laws, pretty copiously and peremptorily, as to what ought or ought not to be done, and Mr. Davenport has conscientiously carried out this plan. His work bristles throughout with such rules, and we may safely say that if any student can succeed, either with or without the professor's help, in mastering them, he ought to be competent to write very good harmony. If he is of an inquiring mind, and wants to know *why* he is strictly enjoined to do so and so, or strictly forbidden to do so and so, he should postpone his curiosity till he has finished his academical course, and in the meantime be content with the Dicta of Doctor Day.

We must do Mr. Davenport the justice to remark that he has added to the work an original feature of his own which is worthy of all praise, namely, the combination of *counterpoint* with harmony-teaching. It is the general custom to give the harmony examples in the form of pianoforte chords, and this produces the anomaly that when rules have to be stated affecting the motion of certain notes, an idea of part-writing must enter which is somewhat foreign to the general system. Our author has taken the bull by the horns, by requiring the student *ab initio* to write his harmony in separate parts, putting each part on a separate line with its proper clefs. This is an excellent idea. Counterpoint is the highest and most perfect style of musical writing, but it has been much neglected in late days, and Mr. Davenport has hit upon a happy mode of encouraging its cultivation, which cannot fail to benefit his pupils.

PEARLS AND PEARLING LIFE

Pearls and Pearling Life. By Edwin W. Streeter, F.R.G.S. (London: George Bell and Sons, 1886.)

THE book before us, according to the preface, and as far as we are aware, is the only work in the English language which is entirely devoted to the history of pearls. The introductory chapter is immediately followed by one which gives a brief historical account of pearls in connection with India, China, Persia, Palestine, Egypt, Ancient Greece and Italy, and Europe in the Middle Ages. This is succeeded by a *résumé* of the ancient ideas respecting the origin and supposed medicinal qualities of pearls, and by a few words on "breeding" pearls. The next chapter treats of the different kinds of pearl-forming mollusks, both marine and fluviatile. The writer then gives an account of the true mother-of-pearl shell, describing its geographical distribution, the different varieties, its structure, the parasites found within the shells, and their external enemies, their method of getting rid of extraneous substances (stones, small shells, &c.) accidentally introduced within the valves of the shell, and the uses to which the mother-of-pearl is put. The sixth chapter, although headed "The Origin and Formation of Pearls," also refers to the different kinds, such as *bouton* pearls, *baroque* pearls, and *coq de perle*, the mode of life of the oyster, the positions in which pearls are found, &c. It also treats of the qualities which regulate the value of pearls. The next chapter gives a short account of the Sooloo Archipelago, the natives as pearl-divers, and their method of dredging. Then follows a good description of the fisheries of North-West Australia and Torres Strait, and this is succeeded by an interesting chapter entitled "Pearling Life at the Present Day," which is practically descriptive of pearling expeditions made by Mr. Streeter's vessel, the *Sree Pas Sair*, from Singapore